U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/90013(DRSS)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: May 13-31, 1990

Inspectors: C. F. Gill, Team Leader — Date: 7/12/90

R. A. Paul, Team Member — Date: 7/12/90

M. A. Kunowski, Team Member — Date: 7/13/90

T. F. Dragoun, Team Member — Date: 7/12/90

Accompanied By: A. W. Markley, Team Member
L. L. Coblentz, Team Member
B. J. Dionne, Team Member

Approved By: W. G. Snell, Chief, Radiological Controls and Emergency Preparedness Section — Date: 7/12/90

Inspection Summary

Inspection on May 13-31, 1990 (Report No. 50-255/90013(DRSS))
Areas Inspected: Special, announced assessment of the ALARA program (IP 83728).
Results: The licensee has implemented a generally adequate ALARA program, that with further development has the elements necessary to become a good

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program. However, there were many areas identified where actions could be taken to improve the program. Some of the areas where improvement could be achieved included training, dose reduction for major job tasks, corporate and management support, ALARA involvement in planning, ALARA awareness and initiatives and ALARA procedures. No violations or deviations were identified.

DETAILS

1. Persons Contacted

Consumers Power Company

J. Alderink, Industry Experience and Assessment Administrator
C. Axtell, Health Physics Consultant
R. Beeker, Audit Supervisor
E. Bogue, ALARA Coordinator
J. Brunet, Senior Licensing Analyst
J. Fontaine, Senior Health Physicist
K. Haas, Radiological Services Manager
J. Hadl, Senior QA Consultant
J. Hanson, Operations Superintendent
D. P. Hoffman, Vice President, Nuclear Operations
D. W. Joos, Vice President, Energy Supply Services
M. Lesinski, SGRP Health Physics Manager
R. McCaleb, QA Director
M. Mennucci, Senior Health Physicist
R. Orosz, Engineering and Maintenance Manager
C. Plachta, Senior HP Technician
J. Pomaranski, Site Projects Manager, ESS
G. Slade, Plant General Manager
G. Smith, Senior Nuclear Operations Analyst
D. VandeWalle, Technical Director

Nuclear Regulatory Commission, Region III

B. Burgess, Chief, Reactor Projects Section 2A
L. Greger, Chief, Reactor Programs Branch
W. Snell, Chief, Radiological Controls and Emergency Preparedness Section
E. Swanson, Senior Resident Inspector

The above persons attended the exit meeting on May 31, 1990. Additional licensee personnel were contacted during the course of the inspection.

2. Dose Evaluation

a. Introduction

This ALARA assessment was prompted, in part, by the high annual collective dose experienced in 1988 at the Palisades Plant. As part of this assessment, an analysis of the licensee's radiological dose data was performed in an attempt to identify the potential causes for the elevated collective dose, as well as to evaluate the effectiveness of the licensee's efforts to reduce dose at Palisades. The inspection also included a systematic review of the major elements of the licensee's ALARA program and an evaluation of the effectiveness of its implementation.

b. Collective Dose

The collective dose from 1986 to 1989 for Palisades was compared with that for the average U.S. Pressurized Water Reactor (PWR). In 1986, Palisades was 63% above the average collective dose for PWRs. This decreased in 1987 to +12% and in 1988 increased to +117%. The collective dose for Palisades dropped from 730 in 1988 to 294 person-rem in 1989. This value is expected to be about the same as the average collective dose for PWRs in 1989. Palisades collective dose ranked 8th highest out of 59 PWRs in 1986, 13th out of 64 PWRs in 1987, 4th out of 68 PWRs in 1988, and is expected to rank near the middle of 72 PWRs in 1989. (See Attachment 1, Item A)

c. Average Individual Dose

A review of the average individual dose was performed for the period 1986 to 1989. Palisades average individual dose was 20% above the average annual dose for PWR radiation workers in 1986, - 2% in 1987, and +39% in 1988. The average individual dose decreased in 1989 at Palisades to 286 mrem/yr, which is expected to be slightly lower than the average individual dose at U.S. PWRs. (See Attachment 1, Item B)

d. Daily Collective Dose

A review of the daily collective dose was performed to determine if the average daily dose being expended during non-outage and outage periods was higher than that at other PWRs. Palisades daily collective dose per reactor was 121% higher than other PWRs during non-outage periods and 39% lower during outage periods. (See Attachment 1, Item C)

e. Exposure Rates

In an attempt to determine if the increased collective dose was due to higher than average exposure rates, a comparison was performed of Palisades' steam generator tube sheet shutdown radiation levels with those from other Combustion Engineering (CE) PWRs. Attachment 2 is a figure which makes this comparison for the period from 1971 to 1978. At present, steam generator tube sheet radiation levels at Palisades are 4 to 7 R/hr at contact. A review of this information indicated that Palisades radiation levels inside the steam generators are, in general, lower than those presented for CE PWRs in Combustion Engineering Report No. NPSD-69 entitled "Dose Rate & Man-Rem Measurement Program." It should be noted that this comparison is cursory, and does not include other work location radiation levels. Therefore, caution should be exercised so as not to construe these results as definitive.

f. Repetitive High-Dose Jobs

To further identify the potential causes for the elevated collective doses, a review of the repetitive high-dose jobs that were conducted during outages and during routine operations was performed. The collective doses for Palisades repetitive high-dose jobs from the 1983, 1985, and 1988 refueling outages were compared against those reported in NUREG/CR-4254 (Attachment 3, Item A). Only ten of the 25 values reviewed for high-dose jobs during refueling outages were above the average values for CE-PWRs. In general, high-dose jobs were near or below the average values for repetitive refueling outage high-dose jobs.

The trend in the total collective doses for outage repetitive jobs was compared against the average total collective dose for these same jobs at CE-PWRs as reported in NUREG/CR-4254. The average for CE-PWR repetitive high dose jobs conducted during outages totaled 320 person-rem. Palisades expended 390 person-rem during the 1983 RFO, 190 during the 1985 RFO, and 170 during the 1988 RFO. This indicates that Palisades has been successful in reducing repetitive high dose jobs conducted during refueling outages.

The collective doses for Palisades repetitive high-dose jobs conducted during routine operations and outages during 1985 - 1989 were compared against those reported in NUREG/CR-4254 (Attachment 3, Item B). Twenty-three out of thirty values reviewed for repetitive high-dose jobs during routine operations and outages were above the average values for CE PWRs. This indicates that repetitive high-dose jobs conducted during routine operations may account for a portion of the above average collective dose at Palisades.

The trend in the total collective doses for repetitive high dose jobs conducted during outages and routine operations was compared against the total collective doses for these same jobs at CE-PWRs, as reported in NUREG/CR-4254. The average total for CE-PWRs was 60 person-rem. Palisades expended 200 person-rem during 1985 and 1986, 170 during 1987, 150 during 1988, and 78 during 1989. Although a downward trend has been achieved, additional effort is required to reduce these repetitive job exposures below the referenced CE-PWR industry averages.

ALARA post-job review records were examined to identify problems encountered and the corrective actions identified for these repetitive high-dose jobs. The inspectors also discussed with licensee personnel the licensee-identified problems, and corrective actions taken or planned. In addition, the various dose and contamination reduction techniques found in Appendix B of NUREG/CR-4254 were discussed. The inspectors concluded that the post-job review process has generally resulted in the identification

of significant problems which are usually resolved in a timely manner with appropriate corrective actions. The downward trend in dose for most of these high-dose jobs demonstrates the effectiveness of the licensee's efforts.

g. Non-Repetitive High-Dose Jobs

A review of the non-repetitive high-dose jobs was performed to determine if the large amount of non-routine work resulted in the high exposures incurred in 1986 through 1989. Because special maintenance activities constitute the largest work function dose category for U.S. PWRs (NUREG-0713) and are generally non-repetitive, these activities at Palisades were compared to the average U.S. PWR. The collective doses for special maintenance in 1986 - 1989 are shown in Attachment 4 Items A and B for Palisades and the U.S. PWR average, respectively. Subtracting these totals from the plant collective doses yields the adjusted collective doses shown in Attachment 4.

These adjusted totals indicate that Palisades collective dose in 1986 was 133% above the average PWR, +40% in 1987, +190% in 1988, and will likely exceed the average in 1989. The average annual percent of the collective dose for special maintenance during 1986-1989 at Palisades was 14%, compared to 32% for the average U.S. PWR during 1986-1987. Based on data comparisons and interviews with plant staff, the inspectors concluded that the licensee's elevated doses are not a result of special maintenance activities.

h. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strength: Efforts to reduce doses for certain repetitive high-dose jobs have been relatively successful.

Improvement Item: Conduct continuing comparisons of radiation dose data at Palisades with that for the average U.S. PWR to identify areas where improvement is warranted, and implement corrective actions as appropriate to reduce doses.

3. ALARA Program/Organization

a. Introduction

The licensee implemented a program to maintain occupational exposure as low as reasonably achievable (ALARA) when the ALARA policy statement contained in the Nuclear Operations Department Radiation Safety Plan (Parts 2 and 3) was issued in 1981. The requirements and guidelines of the plan are specified by Corporate Nuclear Operations Department Standard No. NODS-H01, "Health Physics Standard." The first ALARA Committee meeting was convened at the

Palisades Nuclear Generating Plant on April 21, 1981. The corporate ALARA Engineer and station ALARA Coordinator positions were established in August 1981. A procedure for performing an ALARA job review was implemented in August 1982. A procedure for incorporating ALARA design considerations into major and minor modifications was implemented in 1985.

b. ALARA Program

The station's ALARA program is described in Palisades Administrative Procedure No. 7.02, Revision 3, "ALARA Program" and is implemented by two ALARA groups within the Radiological Services Department (RSD). The procedure was written to establish policies, goals, and standards to reduce total personnel radiation exposure at Palisades in accordance with Section V, Part 3, "ALARA Program," of the corporate Radiation Safety Plan. The adequacy of the procedure is discussed in Section 7. The Radiation Safety Plan was developed and is maintained by the Corporate Health Physicist to satisfy corporate Standard No. NODS-H01. Notwithstanding the corporate Radiation Safety Plan and Standard, an explicit, written endorsement of ALARA from corporate management is lacking. This matter and corporate involvement in the ALARA program, in general, are discussed further in Section 4.

The ALARA program for the Steam Generator Replacement Project (SGRP) was briefly reviewed. At the time of the inspection, the SGRP ALARA group was generally operating under the station's ALARA program procedure, with additional guidance provided by certain policies developed by the SGRP ALARA group. These policies are part of the SGRP draft Project Radiological Plan, which is intended to augment station radiation protection procedures and to provide additional, project-specific guidance. At the time of the inspection, the Plan had not been approved pending licensee decisions regarding SGRP RP/ALARA organizational structure, assignments, duties, responsibilities, and authority. Discussions with the SGRP ALARA Coordinator and the SGRP HP Manager, both with prior experience in similar positions, and a review of the draft Plan and a draft RSD-SGRP interface document developed by the SGRP radiation protection group indicated that the SGRP ALARA program should be adequate for the SGRP if implemented as planned.

At the end of the inspection, the licensee stated that an RP/ALARA organization structure for the SGRP had been adopted, and that the RSD and the SGRP contractor RP group would meet in early June to assign personnel to the adopted organization, determine needs for procedure revisions, establish schedules and milestones, and develop an interface agreement.

c. Organization and Staffing

Prior to December 1989, there was only one RSD ALARA group, consisting of an ALARA Coordinator and 3-4 senior radiation safety technicians (RSTs) during normal operations, and augmented during major outages with several contractor technicians. The ALARA Coordinator reported to the Health Physics (HP) Superintendent, who reported to the RSD Manager. The major duties of the group were the traditional ALARA activities and the preparation of all Radiation Work Permits (RWPs). In December 1989, the licensee reorganized the RSD, reassigning the ALARA Coordinator from day-to-day operational activities to the responsibility for long-term ALARA and outage planning, the source term reduction program, and liaison activities between RSD and the SGRP RP/ALARA group. In the new organization, the ALARA Coordinator was assigned three experienced RSTs and reports directly to the RSD Manager. The day-to-day activities, such as RWP preparation and ALARA job reviews, are now the responsibility of the Nuclear Operations Analyst (ALARA Operations Supervisor), who reports to the HP Superintendent and is assisted by 3-4 experienced RSTs.

During the current maintenance outage, the Operations ALARA Analyst functioned as a Duty Health Physicist. His responsibilities in the ALARA group were assumed by an RST, and additional attention to the day-to-day operations was also given by the ALARA Coordinator. This practice of re-assigning ALARA personnel during an outage may detract from the effectiveness of the ALARA Operations Supervisor and ALARA Coordinator positions. Also during the outage, two contractor RSTs were added to the day-to-day ALARA operations staff.

The overall quality and experience of the ALARA personnel appear generally good. However, problems with the job history files, inaccurate task-related dose estimates, and the use of a 3 person-rem minimum limit for initiating an ALARA review compared to the nominal industry limit of 1 person-rem (see Section 7) may indicate that the station ALARA groups are understaffed. (Licensee personnel interviewed stated that the existing staff had not had time to adequately address these matters.)

Discussions with the licensee and a review of procedures indicated that the ALARA Program procedure and Palisades Administrative Procedure No. 7.00, Revision 6, "Radiological Services Department Organization and Responsibilities," have not been revised to describe the new organization and reassigned responsibilities. Informally, the ALARA Coordinator and the Operations ALARA Supervisor have discussed the matter and have demarcated areas of responsibilities. The lack of procedural guidance in this area apparently has not caused significant problems to date but is a weakness that should be corrected to ensure that concerns are promptly addressed by the responsible staff person.

As discussed above, the inspectors reviewed the SGRP ALARA program, including organization and staffing. At the end of the inspection, the licensee had tentatively established an RP organization for the combined refueling outage and the SGRP. The organization will

consist of two basically separate groups, with the RSD responsible for refueling activities and the SGRP RP/ALARA group responsible for steam generator replacement activities; however, the station duty HP will have definitive decision-making authority over all day-to-day containment activities. The SGRP ALARA Coordinator and the RP Manager have extensive experience, including participation in the steam generator replacement project at D.C. Cook and the recirculation piping replacement project at Dresden. In addition, the station ALARA Coordinator and two experienced station technicians have been detailed to the SGRP ALARA group, and two experienced contractor technicians are employed by the main contractor for the SGRP to provide initial review of work packages for radiation protection concerns.

d. ALARA Program Support and Incentives

Notwithstanding the lack of an explicit written endorsement of ALARA from corporate management, financial support of ALARA efforts was evident and has increased significantly since 1986 (the long-term plan for budgeting ALARA improvement items is included in the licensee's Five-Year Plan). Examples of several large-capital initiatives undertaken by the station are discussed in Section 9. Non-financial support was also evident. Attendance of the Corporate Health Physicist and station upper management at the monthly ALARA Committee meetings has been good. Discussions with the licensee and a review of meeting minutes indicated the Committee was fulfilling its intended functions, including reviewing progress towards exposure goals. However, further improvements in documentation of meeting discussions could be made; these improvements began in mid-1989 when a new secretary was appointed to the Committee. Minutes for the station ALARA Subcommittee, composed of first-line management and workers from various station departments, were also reviewed. Discussions with the licensee and the review of meeting minutes indicated the Subcommittee was fulfilling its intended function. The inspectors attended a Subcommittee meeting; however, because a quorum was not in attendance, the meeting was rescheduled. This incident was isolated; attendance at previous meetings was good.

An ALARA Committee for the SGRP has been established with representatives from the station and SGRP upper management and radiation protection groups to review SGRP ALARA concerns and to advise SGRP and station managers on these concerns. The Corporate Health Physicist is also a member. The Committee is scheduled to meet monthly until the outage activities begin in mid-September 1990, when the meetings will be held weekly. Discussions with the licensee and a review of minutes for the two meetings held to date indicated the Committee was meeting its intended function.

Additional indication of management support of and worker participation in the ALARA program was observed in an active ALARA suggestion program and a "Cost Chopper" program. Awards of nominal value are given for beneficial ALARA suggestions. ALARA suggestions that may

result in significant person-rem savings are usually directed to the "Cost Chopper" program by the ALARA staff to maximize the incentive to workers. Cash/stock awards are given for beneficial ideas submitted to this program. In addition, annual cash bonuses for upper station managers are dependent on the success of the managers' work groups in meeting annual dose goals (discussed further in Section 6), and other station personnel involvement in the ALARA program is bolstered through evaluation of employee efforts to minimize personal radiation exposure during annual employee performance appraisals. The SGRP radiation protection group plans to use the station's ALARA suggestion program.

e. Plant Tours

No significant instances of poor ALARA work habits were observed by the inspectors during tours of the plant. During review of work-in-progress in a high radiation area, a minor problem with the adequacy of protective clothing was observed by the inspectors. The problem was quickly corrected by the licensee. Dose rates measured by the inspectors during the tours were in agreement with licensee survey records and postings.

The inspectors also toured the licensee's recently expanded solid radioactive waste (radwaste) shipping facilities. Formerly, radwaste shipping activities were conducted in two separate buildings. Discussions with the licensee indicated that the Radwaste Shipping Coordinator was involved in the design of the expanded facilities, which now includes additional permanently shielded storage areas for high dose primary system filters, resins, and evaporator bottoms; an enclosed work area and dedicated wood planing equipment for decontaminating scaffolding; a "super" box compactor for compacting dry active waste in 97 ft^3 metal boxes; and a remote tool for high-integrity container lids. The Radwaste Shipping Coordinator stated that the expanded facilities are expected to result in a 2-3 person-rem savings per year for the Radwaste shipping group.

The inspectors also reviewed RWPs maintained at the entrance to the main radiological controlled area (RCA). No major problems were identified with the RWPs; however, several minor problems, relating to general quality control of RWPs, were noted. RWP P900104 contained an ALARA Pre-Job Checklist that referred to an attached memo dated 3-11-87; however, this memo was not attached to the RWP. In addition, the "Radiation Work Plan" attached to the RWP incorrectly specified two pairs of plastic shoe covers and one pair of cloth shoe covers; the RWP specified one pair of nylon booties and one pair of rubber overshoes. RWP P900404 specified that informal or formal prejob briefings were required; however, no criteria were specified in the RWP or in station procedures for determining which type of briefing was required. RWP P900502 contained an illegible Pre-Job Checklist and copies of several pages of the health physics desk log. The copies of the log did not highlight the entry or entries pertinent to

the RWP. SGRP RWPs P900701 and P900702 contained several pages of information related to generation of the RWP by the work group that were unnecessary for workers using the RWP. The problems with the RWPs were discussed with licensee representatives, who agreed that additional quality control was necessary.

f. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- Station ALARA and SGRP RP/ALARA personnel are experienced.
- Station upper management and the Corporate Health Physicist regularly attend station and SGRP ALARA committees.
- Use of monetary incentives to elicit worker ALARA suggestions and to induce department managers to meet annual department ALARA goals.

Improvement Items:

- Increase quality control reviews of RWPs.
- Continue documentation improvements in the minutes of the station ALARA Committee.
- Revise station procedures to reflect the new ALARA organization and establish responsibilities for the two RSD ALARA groups.
- A written endorsement of ALARA should be provided by corporate management.

4. Corporate Involvement

The corporate office support for radiological safety consists of one individual, the Corporate Health Physicist. This individual reports directly to the Director of Nuclear Safety and is responsible for 1) implementing the quality assurance program for personal dosimetry, 2) developing and maintaining the NOD Radiation Safety Plan, 3) attending technical meetings and disseminating applicable information and 4) serving as a member of the Nuclear Safety Review Board. A Corporate ALARA Engineer position was established in August 1981, but was eliminated in a 1985 reorganization.

Presently, the corporate office is assigned the following ALARA functions:

- Review relevant dose-reduction research, practices, and modifications performed in the nuclear industry. Disseminate this information to the appropriate individuals within the organization as well as the Palisades ALARA Committee.

- Appraise the effectiveness of the radiation and contamination control programs, e.g., the 1990 Health Physics Self-Assessment.

- Review plant operating occurrences including significant radiological incidents, e.g., exposures in excess of regulatory limits and NRC inspection findings in Radiation Protection.

- Provide basic guidelines for implementation of the ALARA program, i.e., the Radiation Safety Plan and Standard No. NODS-H01.

Overall, the corporate support of the ALARA program appeared broad in scope but only marginally effective because it consisted of only limited involvement by one individual. Considering the collective dose history at Palisades, additional corporate involvement seems warranted.

Improvement Items:

- Issue a corporate ALARA policy statement which reemphasizes management's commitment towards ALARA and line management's responsibility to reduce dose.

- Strengthen and possibly expand the corporate ALARA functions to aid in reducing doses at Palisades.

5. Training

The inspectors reviewed selected licensee training programs regarding presentation and implementation of ALARA policies and procedures for routine and special work activities. Information was collected by interviews with licensee personnel; procedure and policy reviews; review of instructor lesson plans, trainee study guides, and examinations; and tours of onsite and offsite training facilities.

a. General Employee/Basic Radiation Worker Training (GET/BRWT)

Current lesson plans for GET indicated that basic radiation safety and ALARA concepts were appropriately communicated to all new employees, consistent with the requirements of 10 CFR 19.12. Incoming radiation workers are given an additional 1-2 day course in BRWT, which included demonstrating minimal proficiency in frisking hands and feet, and in donning and removal of protective clothing. The inspectors noted that although BRWT included a lecture on respiratory protection, trainees were not required to demonstrate proper respirator donning or leak-checking techniques, and no hands-on instruction was provided for the respirator prior to the qualifying fit test.

A tour of the GET/BRWT facilities, located in South Haven, Michigan, revealed that considerable effort had gone into upgrading the classrooms and teaching equipment. The inspectors noted, however, that areas presently designated for protective clothing donning and removal were not adequate to meet the stated intention of observing the proficiency of as many as 200 employees in one day.

ALARA aspects of the GET/BWR programs were considered adequate.

b. Advanced Radiation Worker Training

Interviews with Nuclear Training personnel and review of selected lesson plans indicated that non-RSD employees did not, as part of their formal training program, generally receive skill-specific radiological work practices training, other than the general overview given in BRWT. One exception identified was the Advanced Radiation Worker Training (ARWT), given to designated operations department personnel.

The inspectors reviewed the evolution of the licensee's ARWT program to determine the scope, thoroughness, and intended function of the training. Some inconsistencies were noted, as listed below.

The Radiation Safety Plan, Section V, Part 2, "Radiation Work Permits," states that RST coverage or ARWT must be specified on the RWP for such tasks as opening a primary system, working in high radiation areas with levels greater than or equal to 1000 mR/hr, or when the radiological conditions to be encountered are unknown. Administrative Procedure 7.03, "Radiation Work Permit," makes a similar statement in Paragraph 6.4.b, "Unless the workers have received Advanced Radiation Worker Training, Dedicated Radiation Safety Technician coverage shall be specified on the RWP for the following: . . ." followed by a similar, but longer list of tasks, including packaging radwaste.

Although both of the above documents imply that ARWT qualifies a radiation worker for a variety of tasks, Nuclear Training (NT) personnel insisted that the ARWT program, both originally and in its current version was intended solely to allow Auxiliary Operators (AOs) to make self-monitored entries into high radiation areas. NT personnel also stated that the ARWT program had been superseded by the High Radiation Area Access (HRAA) program (part of NT Program 1), and that any procedural references to the ARWT program should be considered out-of-date.

The inspectors noted references to the superseded ARWT program in current revisions of several other licensee policies and procedures, including the course matrix for NT Program 4.3, "Auxiliary Operator Training Program," and HP 2.5, "Entry Control for High Radiation Areas Over 1 R/hr." The inspectors did not identify any licensee procedures, other than NT Program 1, that mentioned the HRAA course.

Comparison of the ARWT course material with the HRAA course material showed that the latter program was considerably reduced in scope, and did not include the ARWT section on "advanced contamination control" or "advanced radioactive material control." The HRAA course was consistent with the current licensee controls stated in Palisades Plant Policy 89-002, "1R Door Verification"; however, RSD Policy 85.021, which governs the qualification of operations

department personnel to perform self-monitoring in high radiation areas, did not reference either the current HRAA program or the current control practices of Policy 89-002.

The inspectors concluded that the lack of procedural clarity, in relation to the current purpose and scope of the ARWT program, left open the potential for misinterpretation and inconsistent radiological control practices. The inspectors further concluded that the absence of skill-specific ALARA training within the formal training programs of non-RSD personnel constituted a missed opportunity for meeting the licensee's safety objective of stimulating plant wide ALARA consciousness.

c. RST Training/HP Continuing Training

The inspectors reviewed NT Program 19, "Radiological Safety and Chemistry Training Program," which outlines the licensee's formal training path for the entry-level RST. Upon completion of GET/BRWT the trainee receives several weeks of OJT, followed by approximately eight weeks at the licensee's Midland training facility. The Midland courses include a generic reactor systems course, HP Fundamentals, and HP-1.

HP Continuing Training, also covered in NT Program 19, is structured to supplement the initial training. RSTs are required each month to attend three 1-hour training sessions, presented in duplicate morning and afternoon classes, with makeups provided for backshift. Examinations accompany each lecture. Documentation of recent HP Continuing Training indicated nearly 100% participation by qualified RSTs.

ALARA aspects of the RST training/HP Continuing Training programs were considered adequate.

d. HP OJT

HP 1.1, "On-the-Job Training," was reviewed for adequacy of the OJT process, procedures, and qualification cards. Several items were found to be out-of-date; for example, the TLD reader practical factors were not applicable to the type of reader currently used by the licensee. In addition, the inspectors noted that the special qualification card for "ALARA/RWP" consisted of only two practical factors, requiring the performance of one pre-job and one post-job review. Interviews with RSD personnel indicated that no additional formal training was given to RSTs designated to write RWPs or perform as ALARA planners. The inspectors did not identify any provisions to ensure that these individuals were trained in other essential areas, such as use and maintenance of job history files, familiarization with the work request/work order routing system, or insertion of ALARA hold points into work procedures.

RSD personnel responsible for the OJT program acknowledged the need for a revision and update of the HP OJT process, procedures, and qualification cards. RSD training personnel stated that this need had already been identified in a review of OJT conducted by an instructional technologist from the licensee's Midland training center. Efforts to complete a substantial revision of the HP OJT process are scheduled for completion by February 1991.

The inspectors concluded that a revision of the HP OJT program, as discussed, was necessary to make the program fully effective. The inspectors also concluded that specific attention should be given towards ensuring that ALARA/RWP practical factors thoroughly prepare RSTs for performing as ALARA planners or RWP preparers.

e. Contractor RST Training

The inspectors' examination of contractor RST training lesson plans found them to consist, in large part, of outdated procedures. Modules 86-03, "Radiological Incident Reports," dated May 5, 1986, was the most recent lesson plan. Module I, "Radiation Safety Department Policies/Practices," dated November 1, 1985, did not reflect the current RST organizational structure or policies. Module X, "High Radiation Area Entry >1R/hr," also dated November 1, 1985, took no advantage of the licensee's experience or lessons learned in this area, nor could it be used to teach incoming contractor RSTs current licensee practices.

A consultant had been hired by the licensee to develop training for contractor RSTs for the upcoming SGRP outage. The consultant stated that extensive revisions to the contractor RST training program were in progress, including complete rewriting of the lesson plans, use of a screening pre-exam to verify basic HP knowledge of incoming RSTs, and job-specific training for the SGRP work. The consultant noted, however, that contractor RST training for the April-May 1990 outage had been somewhat inadequate, due to the need for extensive lesson plan and examination updates. In addition, this training had been conducted in the South Haven training facility, which at that time had no chalk boards, no copying machine, overhead projectors without available overheads, and uncomfortable accommodations. The inspectors' subsequent tour of the facility, described in Section 4.a., above, showed that these unfavorable training conditions had been corrected.

The inspectors concluded that contractor RST training has suffered from a lack of attention and that past failures to maintain lesson plans current and ensure consistency between contractor RSTs and licensee RSTs held the potential for impacting ALARA efforts with inadequate or inconsistent RST job coverage.

f. ALARA Engineering Technology Training

The inspectors reviewed training records and lesson plans for the licensee's ALARA Engineering Technology (AET) training. Currently structured as a 16-hour course, AET includes general ALARA principles, crud activation and deposition, in-place maintenance, plant layout, traffic patterns, shielding design, cost analyses, job planning and control, and ALARA reviews. Available training records indicated that, although AET had been offered several times since 1985, only about 16 Palisades employees had attended (although the attendance list for contractors was somewhat longer).

Several AET attendees told the inspectors that the course was ineffective because it placed too much emphasis on general HP principles, rather than emphasizing design engineering from an ALARA perspective. One system engineer expressed the opinion that the misplaced emphasis was due to AET lesson plans being written by HPs rather than by experienced engineers.

NT personnel acknowledged these observations, noting that several extensive AET revisions had already been conducted, and that continuing efforts were in progress to make the course both attractive and effective for technical and engineering attendees. The roster for the upcoming June 27-28, 1990, AET course listed 10 prospective attendees, with a notable cross-section of personnel from the operations, maintenance, and engineering groups.

The inspectors concluded that the licensee's ongoing efforts seem well-directed toward establishing an adequate AET training program.

g. Specialized Training for ALARA Personnel

The inspectors reviewed RSD participation in professional workshops and seminars related to ALARA. The HP superintendent and the corporate ALARA design engineer had attended the 1989 Brookhaven National Laboratory ALARA Conference; the corporate ALARA design engineer had also attended the 1989 EPRI workshop.

Both the ALARA Coordinator and the ALARA Operations Supervisor regularly attend the Westinghouse REM seminar. The ALARA Coordinator had also attended the 1989 INPO RPM workshop, the 1989 Region III ALARA coordinator meeting, and various certification training courses.

The ALARA Coordinator stated that several of these workshops and seminars had proved helpful. As an example, the purchase and use of a surrogate tour system (see Section 9) as an ALARA tool had been prompted by a Region III ALARA coordinator meeting.

h. Use of Mockup Training

Interviews with the SGRP ALARA planner revealed plans for the use of four major mockups as an ALARA tool for the upcoming SGRP outage. None of the four mockups was available for observation in a ready-to-use condition; however, the licensee seemed confident that each would be completed in time for adequate mockup training. The SGRP ALARA planner stated that mockup training would include all crew leaders and lead technicians, all applicable crafts, and as many RP personnel as possible. In addition, intended simulation of plant conditions will include appropriate lighting, confined spaces, signs, boundaries, protective clothing, respirators, multibadging, pre-job briefings, and RWP sign-ins.

Although construction of these mockups appeared to be somewhat behind schedule, the inspectors concluded that the intended scope and thoroughness of mockup training for the SGRP outage, as planned, appeared to appropriately address ALARA objectives.

i. Training Feedback Initiatives

The inspectors evaluated the licensee's mechanisms for providing feedback to the training department on strengths and weaknesses observed by the operations, maintenance, and radiation protection groups. The Training Review Tracking Committee (TRTC) is one such mechanism, a review board made up of NT instructors and supervisors from each program, as well as departmental training representatives. The TRTC reviews Radiological Incident Reports, plant modifications, Deviation Reports, Event Reports, vendor correspondence, procedural changes, and industry bulletins; those reviews are incorporated into lesson plans.

While the TRTC appeared to serve a valuable function, interviews with several NT personnel and departmental training coordinators indicated that the TRTC was seldom used by operations, maintenance, or radiation protection personnel as a vehicle for providing feedback on ALARA training deficiencies observed during work performance. The inspectors noted that in some instances where specific training deficiencies were identified by a Corrective Action Review Board, training had been conducted for an entire department to promptly correct the problem.

Another training feedback mechanism related to ALARA was initiated by a March 20, 1990 memorandum from the Radiological Services Manager, specifically requesting input toward reformatting lesson plans for contractor RSTs. The inspectors reviewed the file of responses to the memorandum; requests included such items as increasing surrogate tour awareness, clarifying the policy on hot spots, and clarifying the 1 R/hr high radiation area control policy.

The inspectors concluded that more attention should be given toward routing ALARA training suggestions through the TRTC, and toward soliciting such suggestions from operations, maintenance, and radiation safety personnel; however, the training feedback initiated by the memorandum described in the preceding paragraph appeared to be a commendable effort.

j. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Improvement Items:

- The scope and intended function of the Advanced Radiation Worker Training/High Radiation Area Access training should be clearly defined. The lack of procedural clarity, and the inattention to updating applicable procedures, has left open the potential for misinterpretation and inconsistent radiological control practices.

- ALARA concepts should be more thoroughly incorporated into standard Nuclear Training programs for non-RSD personnel.

- The RST OJT program should be revised and updated; specifically, the amount of OJT given to ALARA planners and RWP writers could be improved.

- To improve contractor RST training revise out-of-date lesson plans, provide a screening pre-exam and improve training facilities.

- Revise Administrative Procedure 7.02, "Radiation Work Permits," to clarify the purpose of Advanced Radiation Worker Training. Revise the Radiation Safety Plan, RSD Policy 85.021, and NT Program 4.3 to clarify the current status of this training program.

- Evaluate the usefulness of incorporating ALARA concepts and techniques into applicable NT programs for non-RSD personnel.

- Revise and update the RST OJT program. Specifically, expand the qualification card for ALARA/RWP.

- Ensure that revisions of contractor RST training lesson plans are completed before SGRP outage training begins. Review these lesson plans to ensure that consistent radiological work practices will be implemented by contractor and licensee RSTs.

6. Management Goals

ALARA goal-setting at Palisades was evaluated during reviews of applicable documentation and interviews with plant personnel. Areas examined included methods of estimating dose, accuracy of dose projections, and management involvement. Because the licensee treats SGRP as a separate project, with its own exposure estimates and summaries, SGRP goal-setting is discussed separately.

a. Dose Estimation

The licensee does not have a procedure governing annual collective radiation exposure goal-setting; however, internal memoranda circulated by the ALARA Coordinator at the onset of each year describe the methods of arriving at dose projections and the basis of establishing dose goals. Comparing these memoranda for the past three years revealed a consistent but steadily refined method of setting goals.

1990 was the first instance of significant involvement by department superintendents in ALARA goal-setting. Beginning in October 1989 the ALARA Coordinator compiled a crude estimate of 1990 dose based on the projected scope of 1990 work, number of days of projected scope of 1990 work, number of days of projected outage time, and historical rates of dose accumulation during outage and operational periods. This information, along with 1988 and 1989 exposure data for specific tasks and other relevant historical information was passed on to department superintendents. The superintendents then set initial goals for the year, broken down by specific task and work group. The ALARA Coordinator worked with each superintendent to refine these initial goals, suggest methods of dose reduction, and compare the goal breakdowns to the 1990 project list. The compiled summary of refined exposure goals was then presented to the Radiological Services Manager, and brought before the ALARA Committee for review. The ALARA Committee, consisting of the plant manager and all assistant plant managers, the HP Superintendent, the Chemistry Superintendent, the Engineering and Construction Manager, and the ALARA Coordinator reviewed the projected dose goals systematically, made suggestions and revisions, and gave final approval. The final number for Palisades' overall 1990 collective dose goal, set at 500 person-rem (excluding SGRP activities), was chosen by the plant manager.

The inspectors noted several improvements to the 1990 goal-setting methods over previous years. First, 1990 was the first year to involve department superintendents in setting their own goals. Since the achievement of ALARA goals and objectives is an element in job performance appraisal for employees at the superintendent level and above, this involvement at the goal-setting stage was an apparent effort to define one area of ALARA responsibility and heighten ALARA awareness.

The second apparent improvement to 1990 goal-setting was prompted by the ALARA Committee, and involved the establishment of dual goals as a measurement of dose reduction success. The 1990 goals listed in the ALARA Coordinator's internal memorandum were considered "fully effective" levels of performance; a more stringent set of goals, generally set several percent lower, was passed on to superintendents as a standard of "exceptional" dose reduction success, to provide additional incentive.

In an effort to make the 1990 goals challenging, the estimate of dose accumulation during plant operation used an average accumulation rate from the three best months of 1989, of 185 mrem/day. Specific projects and major recurrent outage task goals were also set by matching the best doses for those jobs from previous years.

The inspectors concluded that dose estimation techniques used in the setting of annual collective exposure goals were adequate in meeting ALARA objectives. Involvement of department superintendents in goal-setting was viewed as a marked improvement and the use of "exceptional" dose target levels was viewed as an innovative method of providing ALARA incentives.

b. Effectiveness in Tracking and Meeting Goals

The licensee uses several methods for tracking actual dose received in relation to projected dose goals. Frequently updated trend graphs are used to plot actual exposure received against the curve of projected dose accumulation; these graphs are maintained for plant-wide exposure, for individual groups such as maintenance/engineering or administrative services, and for specific departments such as electrical or mechanical maintenance. The graphs are circulated to department superintendents, and are conspicuously posted for general viewing at the entrance to access control. Detailed shorter-term graphs are also maintained during outage periods. In addition, periodic reports are circulated which track active RWP accumulated dose versus projected dose.

In 1988, the projected goal of 550 person-rem was exceeded by about 34 per cent. A large portion of the underestimation (about 113 person-rem) was due to unplanned steam generator work; in addition, the refueling outage in 1988 lasted over 100 days, rather than the original estimate of 75 days, and several projects were added to the year's work scope after goals were established. The breakdown of projected versus actual dose by department indicated that only 6 out of 12 departments came within ± 25% of their original annual goal.

In 1989, the original plant goal of 300 person-rem was revised to 400 person-rem when it became clear early in the year that extensive steam generator repairs would take place. Actual exposures; however, were much less than expected; the overall plant dose for 1989, by TLD, was 294 person-rem. No department exceeded its goal; out of 18 departments listed, only 7 were within 25% of their annual goal, and 4 received less than 50% of the dose originally projected.

The inspectors concluded that the licensee's mechanisms for tracking actual versus projected doses were adequate. In relation to the effectiveness of meeting goals, a marked improvement was noted in 1989 over previous years; however, the fact that actual dose was significantly lower than the annual goal for most departments indicated that 1989 goals might have been more challenging.

c. Steam Generator Replacement Project (SGRP)

The SGRP group established its own annual dose goal of 699 person-rem, to be tracked separately from the plant annual collective dose goal of 500 person-rem. This separation was partially intended to serve as an ALARA initiative to the vendor, with substantial monetary incentives offered by the licensee for every person-rem under goal which the vendor achieves.

Goals for the SGRP were broken down by task and, where possible, by individual RWP. The vendor's estimates of man-hours and task breakdown were used in conjunction with job histories from industry experience in steam generator replacement and related tasks. These time estimates were merged with the licensee's data on high, general, and low dose rates in the work area for each task, and weighting factors were assigned based on estimates of which specific locations would be occupied for the majority of the time spent on the task. A construction dilution faction was also applied to account for time spent dressing out, walking to and from the job site, and so forth.

The ALARA planner for the SGRP submitted the final estimate of projected dose to the SGRP Project Radiation Protection Manager, who in turn presented the SGRP dose goals to the ALARA Committee. At the time of the inspectors' appraisal, final bargaining was still to take place between licensee and vendor as to the agreed-upon goals and associated financial incentives.

The inspectors concluded that the methods used to set SGRP ALARA goals were adequate.

d. Management Involvement

Management participation in actual dose goal-setting was most evident in the ALARA Committee. All plant managers are members of the ALARA Committee, and the ALARA Committee conducts the final review of annual collective dose goals. This arrangement serves the dual function of adding management insight to the goal-setting process and maintaining management awareness of ALARA considerations.

In an effort to determine management support and direction of ALARA initiatives and goals, the inspectors interviewed several members of the Scope Control Team (SCT). The SCT is the controlling board for implementation of the licensee's Five-Year Plan. The SCT consists primarily of the Plant Manager and his department managers. The SCT reviews projects proposed by program managers throughout the plant, to establish priority and assess scope, to determine the appropriate degree of focus on the specific issue, and to permit all managers to have input.

In all cases, the SCT members interviewed were knowledgeable of recent ALARA initiatives, and management support of the ALARA program, in general, appeared highly adequate. However, the management involvement appeared to be more reactive than directive; that is, in order for ALARA considerations to be implemented, individual initiatives needed to be taken at the superintendent level and subsequently presented to the SCT, as opposed to a specifically directed ALARA improvement plan being directed from the level of higher management. When asked to identify the direction that future ALARA initiatives should take, each SCT member interviewed had a different answer: one stated that ALARA concepts had to be ingrained into the minds of individual workers, another stated that hot spots and general area radiation levels had to be reduced, another said that continued attention had to be focused on minimizing personnel contaminations, and so forth.

The inspectors noted that the lack of an overall management-directed ALARA improvement plan may also have been a reason for observed disparity between different licensee groups in awareness of ALARA goals and objectives. This disparity was evident in interviews with various licensee first-line supervisors and planners. While some groups (such as the refueling project personnel) seemed to have a high level of ALARA awareness and a high degree of participation in establishing and implementing ALARA objectives, other groups (such as mechanical maintenance planning) seemed to regard the implementation of ALARA concepts and goals as the function of the Radiological Services Department.

The inspectors concluded that, while management involvement in setting annual collective dose goals and management support of most ALARA initiatives appeared adequate, additional consideration should be given to establishing overall management-directed ALARA objectives.

e. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA Program.

Strength: Involving superintendents in setting annual dose goals for 1990 was an improvement over previous years, and the establishment of additional "exceptional" target levels appeared to be effective in providing additional incentive for ALARA initiatives.

Improvement Items:

- Develop an overall management-directed ALARA improvement plan to improve the level of ALARA awareness and involvement in ALARA initiatives among various licensee groups.

- Establish a standard procedure for setting annual collective dose goals, to ensure that the present goal-setting techniques are not overly dependent on the presence of the current ALARA coordinator.

- Develop and implement a management-directed ALARA improvement plan.

7. ALARA/RWP Procedure Implementation

a. ALARA/RWP Procedures

The licensee uses a radiation work permit (RWP) system to evaluate the radiological conditions and to specify the radiological control requirements to be implemented for radiological work. Administrative Procedure No. 7.03, "Radiation Work Permit," defines the purpose of RWPs and establishes criteria for RWP preparation and approval. There are two types of RWPs: General, which is used for routine repetitive access to work in radiologically controlled areas (RCAs); and Standard, which is required for specific jobs and where significant dose, contamination, or airborne activity may be involved. Standard RWPs are valid for the duration of the job and if required by the RWP, periodically reviewed during the job. The procedure specifies a 72-hour lead time for submittal of RWPs for ALARA review, which in most cases, according to the licensee, is sufficient time to perform the review.

The policies, goals and standards to reduce personnel radiation exposure are specified by licensee Procedure No. 7.02 "ALARA Program". It establishes criteria for ALARA reviews based on radiological conditions and defines responsibilities for management and workers. It also addresses such matters as time requirements for RWP submittal, sets the criteria for pre and post-job ALARA reviews, use of job history files, cost-benefit analyses and dose tracking. One of the criteria for initiation of an ALARA review is when a specific job is expected to exceed 3 person-rem. The inspectors informed the licensee the industry norm is 1 person-rem which affords closer scrutiny of dose producing jobs. The procedure includes a pre and post-job checklist and provides guidance for pre and post-job briefings and use of the pre and post-job checklist. The inspectors noted that the procedure has not been updated to

reflect the current organization of RSD. Specifically, some positions now exist (ALARA Coordinator and ALARA Operational Supervisor) for which responsibilities are not clearly delineated. The procedure also specifies the word "should" instead of "shall" in many sections which weakens the procedure and conveys an impression of weak management support for ALARA. For instance, the procedure specifies that the ALARA Coordinator should perform a documented review of any operations, procedures or designs where specific criteria exist, that a formal briefing should be conducted before the job if it meets certain criteria, that review findings should be recorded and made part of the Job History File, and, that the Job History Files should be maintained and should include certain material that may aid in future jobs. Problems identified elsewhere in this section regarding incomplete historical files and poor ALARA reviews are partially the result of the loosely defined requirements in the procedure. The inspectors concluded that the weak procedural criteria are not indicative of strong management support which would be a necessary prerequisite to the implementation of an effective proactive ALARA program.

The licensee's administrative procedures describe the preparation, revision, and review of station procedures. However, they do not require or provide for review of other department procedures from an ALARA standpoint. This contributed to the impression that ALARA is primarily the responsibility of the RSD RP/ALARA staff rather than of the entire station. The ALARA staff does, however, review special procedures written to cover certain work activities that have significant radiological concerns.

In addition to the loosely defined requirements of the ALARA procedure, the inspectors noted the procedure does not stress fundamental dose reduction techniques such as ensuring that only essential personnel and appropriate equipment be used, nor does it address the need for other departments to maintain lessons learned and good historical information from previous jobs for use during the work order and planning process. Without sufficient historical information, including lessons learned, the potential exists that unnecessary personal radiation exposures may not be precluded. During one recent example (April 1990) involving repair of HPSI check valves, the actual dose for the job was about 20 person-rem greater than the projected dose of 10 person-rem. Owing to problems caused by the welding process used, the work time was much longer than anticipated. During the post-job review of this job it was discovered that similar problems associated with the welding process occurred during performance of the same work in 1983 and 1986, but that information had not been kept in the maintenance history files. The availability of that information could have prevented or reduced the exposure during the most recent work evolution.

b. ALARA Input into Job Planning

There is no formal policy/mechanism to ensure that ALARA personnal are involved in the work order/package review process. However, a

pilot program established in 1989 between the ALARA group and mechanical maintenance allows the ALARA group to routinely review all work orders for the mechanical maintenance department. They can add steps or establish hold points; however, mechanical maintenance can bypass these points at their discretion (See Section 8). ALARA personnel also participate in outage planning, systems and station modification meetings which affords the ALARA operational group advance knowledge of upcoming work. This group performs all surveys for the ALARA review and prepares all RWPs; work activities are reviewed on a sub-task basis.

The inspectors reviewed the adequacy of the licensee's person-hour and person-rem estimations for completed RWPs for recent outages. Estimated person-hours for tasks are provided by the work analyst for the total job. The ALARA operational group evaluates the estimate based on previous history if available and may change the estimate if it appears inordinately high or low; however, it is generally accepted. During a review of a printout containing about 90 RWPs initiated in 1988, 1989, through April 1990, which required pre and post-job ALARA reviews, the inspectors noted that most jobs exceeded the estimated person-hour and person-rem projections; many by greater than 50%. In most cases the greater than expected doses were the result of underestimated person-hours because of inadequate data in the job planner historical files. It was also noted that there were about 35 RWPs written for jobs that actually exceeded three person-rem that had not received an ALARA review because the estimated doses were less than 3 person-rem. Some of RWPs were designated as General RWPs, which do not require ALARA reviews, and some standard RWPs were not reviewed at the discretion of the ALARA Coordinator because of the nature and duration of the jobs. However, several of the reviews were not performed only because inappropriately low person-hour estimates partially caused the projected doses for the jobs to be below the 3 person-rem action level for ALARA reviews. For example, the actual time to replace damaged hangars in the containment was about 3 times the projected time and the dose was about 2 times that estimated. Similarly, the actual time for labor support for removing/replacing insulation for ISI work was about 7 times the projected time and the actual dose was about 4 times that estimated.

Inspectors also noted that during the 1988 and 1989 outages there were considerable doses for HP surveillance and survey activities in the containment performed under Standard RWPs. Specifically, 2.5 projected versus 35 actual person-rem and 0.8 projected versus 14 actual person-rem for 1988 and 1989, respectively; thus neither of these task activities required ALARA reviews. Although some of the dose can be attributed to the RWP work activities under which the RSTs were working, much of this dose was actually received while RSTs were performing HP activities for work being performed under other Standard RWPs in containment, according to licensee representatives. Thus, the RSTs inappropriately utilized the

containment surveillance/survey RWPs. According to the licensee, personal dose should be attributed to the actual RWP under which the work is performed. Better dose accounting on Standard RWPs should be required to ensure proper planning is accomplished for future similar jobs, and for proper tracking and evaluation of RST daily exposures. This matter is considered a programmatic weakness because it occurred during at least two consecutive outages and the licensee was unable to ascertain dose accumulation to HP personnel performing specific tasks in containment.

Some of the significant discrepancies between proposed and actual person-hours and person-rem are the result of changing job scope due to unforeseen problems, poor work practices, and lack of proper equipment. However, based on discussions with licensee personnel and a review of certain job history files, it appears the job planners do not have sufficient historical data and the information which is available is not used effectively as evidenced by the HPSI check valve job discussed in Part a of this section. One of the most significant effects of underestimating person-hour and person-rem projections is the failure to perform ALARA pre and post-job reviews.

The inspectors also discussed with members of the RSD RP/ALARA supervision/management staff several large work evolutions (tasks) whose dose projections were specified by numerous RWPs (sub-tasks), nearly all of which were estimated to be less than 3 person-rem (even though the total for each work evolution was projected to be many times the 3 person-rem criterion for ALARA reviews). The licensee representatives contacted agreed that task ALARA review criteria should be developed to supplement the sub-task (RWP) person-rem projection criterion to increase the ALARA scrutiny of large work evolutions.

c. Procedure Implementation

The inspectors review of the ALARA controls outlined in the RWP and ALARA procedures indicated these implementing procedures address the essential elements of an ALARA program for performing pre and post-job ALARA reviews and controls for radiological work activities. However, the following concerns were identified:

- Although the ALARA procedure indicates that maintenance and modification planning staffs should incorporate exposure reduction methods into work packages and radiological considerations should be incorporated during the job planning process, based on the review of several work packages and discussions with personnel, there does not appear to be a significant effort by other than RSD RP/ALARA personnel to

incorporate exposure reduction efforts into the job planning process. Although the RSD RP/ALARA staff is proactive and conscientious, their efforts could be much more effective if they were more thoroughly involved the planning process and if planners were generally more aggressive in implementing ALARA principles as an integral part of the job planning process.

- The ALARA procedure states that job history files should be maintained by the ALARA Coordinator as the primary source for future planning, and they should include the planning package, exposure estimates, actual exposures, post-job reviews, drawings, photographs and lessons learned. The inspectors found that although the files are maintained in the ALARA group, many are incomplete and do not contain the specified information.

d. ALARA Job Reviews

The RWP and ALARA program procedures specify the methods to be used to perform ongoing job reviews of radiological work activities, track doses, and perform pre and post-job reviews. Documentation reviews and discussions with licensee personnel indicated that in the past two years almost all formal ALARA pre and post-job reviews required were performed. Based on the quality of post-job reviews for certain jobs such as the removal and replacement of PORVs and piping, the S/G inspection and repair job, and the HPSI check valve job, it appeared that the quality of post-job ALARA reviews was good.

e. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- The quality of post-job ALARA reviews appeared good.
- The RSD RP/ALARA staff is proactive and conscientious in incorporating ALARA principles into the job planning process.

Improvement Items:

- The ALARA procedure should be revised to provide more stringent criteria for ALARA review activities.
- ALARA job history files and job planner files should be upgraded to include additional relevant historical information.
- Improve person-rem and dose estimations to preclude further failures to conduct needed pre and post-job ALARA reviews.

- Develop a formal mechanism to ensure adequate ALARA involvement in work package preparation and pre-job planning activities.

- Implement corrective actions to ensure that RST dose is attributed to the proper RWP under which it was accumulated.

- Consider establishing a task limit even if individual RWPs associated with that task are all below the 3 person-rem criterion for ALARA reviews.

- Consideration should be given to lowering the 3 person-rem criterion for ALARA reviews.

8. Planning/Scheduling

The inspectors reviewed the adequacy of the work planning and scheduling process for allowing sufficient lead time to incorporate ALARA concerns.

a. Long-term Planning

Long-term planning is contained within the licensee's Five-Year Plan. The Plan is reviewed quarterly by the SCT (see Section 6), and is revised accordingly. Annually, the Plan may again be revised when the station's budget is determined. The ALARA Coordinator is responsible for the ALARA section in the Plan, consisting of mainly large-capital, dose saving or source reduction initiatives. Large capital jobs in other departments are also included in the Five-Year Plan. The inspectors' review indicated that the licensee's long-term planning process provides adequate notification to the ALARA group of future, large dose jobs, and adequate direction for implementation of large-capital, dose saving or source reduction initiatives.

b. Short-term Planning

Short-term planning is accomplished with the station's running 72-hour and four-week schedules, and outage schedules. The station's Operations Scheduling Coordinator and the planning group develop these schedules and meet daily with representatives of the work groups and the station RWP/ALARA and operations health physics groups to review the established 72-hour and four-week schedules. Problems with meeting the schedules or providing support to the lead work groups are discussed at these meetings. The 72-hour schedule is updated daily, whereas the four-week schedule is updated weekly. An outage emergent work schedule is also maintained and updated several times each week. The Operations Scheduling Coordinator meets with work group planners prior to work scheduling to review work orders and assign them to outage schedule "windows" or time slots. Non-outage work requests are also reviewed prior to scheduling to ensure efficient use of Operations Department personnel for any equipment tagouts and surveillances required because of the planned work.

For outage work, the RWP/ALARA group stated that there is sufficient lead-time for writing RWPs and conducting ALARA reviews because several weeks before work items are listed in the 72-hour schedule they informally meet with work planners to discuss jobs. In addition, for several recent outages persons from the RWP/ALARA group have been detailed to certain work groups (i.e., the station construction group, to a group established to reinspect safety related pipe hangers, and to the SGRP) to review work orders early in the development phase and to initiate RWPs and ALARA reviews. According to the licensee, these details have improved the quality and timeliness of RWP preparation and ALARA reviews.

For non-outage work, however, ALARA personnel stated to the inspectors that they commonly do not have knowledge of jobs until they are listed on the 72-hour schedule. They stated that in most cases, this notice was adequate to prepare an RWP and conduct an ALARA review, if necessary; however, for some jobs, the notice was barely sufficient, or was insufficient, because the jobs were complex and adequate reviews could not be done in the time allotted or the work plan did not take into account certain radiological conditions, resulting in a need for a revision of the work order. Licensee representatives stated that for several work orders, the disparity between the work plan and the jobsite radiological conditions indicated that the planners had not walked down the jobsite prior to the planning. Several efforts taken to allow RWP/ALARA personnel to review work orders earlier in the development/scheduling process have not been fully successful. Recently, an RWP/ALARA staff person had been assigned to review non-outage mechanical maintenance department work orders, but the assignment was terminated earlier than planned because of other demands on the staff person's time. And a recent change to the computerized work order preparation mode of the AMMS (Advanced Maintenance Management System) that allowed for online approval of work orders by the RWP/ALARA group has been routinely circumvented according to several mechanical maintenance planners. This circumvention essentially short-circuiting any potential early ALARA involvement in the work order preparation. Most of the mechanical maintenance planners interviewed by the inspectors stated that the ALARA aspect of planning was RSD's responsibility and not theirs. They also stated that the responsibility for initiation of RWPs between mechanical maintenance and RSD had changed several times recently by verbal directive and they were confused regarding the current status because of these changes.

Additional effort by the licensee to ensure that the RWP/ALARA staff has sufficient time to review non-outage work packages appears necessary. This effort could take the form of a revision to Administrative Procedure No. 5.01, "Processing Work Requests/Work Orders," to include a requirement that work planners notify the RWP/ALARA group as soon as possible of a need for an RWP (currently only a 72-hour lead-time is required), establishment of an RWP/ALARA group liaison in the major work groups for non-outage work activities

(with relief provided from other job activities), improved communications between the RWP/ALARA group and the Operations Scheduling Coordinator, and/or revision of the work order process to require RSD review of work packages before approval.

The inspectors also reviewed the adequacy of the work planning and scheduling process for the SGRP. Although there has been a delay in establishing an approved radiation protection plan and an interface document between the SGRP radiation protection group and RSD (Section 3), the planning and scheduling process for the SGRP appeared adequate.

The inspectors also reviewed the adequacy of the RWP/ALARA planning and implementation for a safety-related hanger inspection project. The project was managed by the station's former ALARA Coordinator. The review indicated that RWP/ALARA planning and implementation for project was good. Project members and SGRP personnel stated that they made extensive use of the surrogate tour system (see Section 8) in their planning.

c. Temporary Shielding

An additional area related to ALARA planning that needs improvement is timeliness of engineering evaluations for temporary shielding installation requests. A review of shielding evaluations and discussions with licensee representatives indicated that although engineering analyses were usually promptly performed for job specific shielding requests (the analyses were completed in one day to several weeks), several analyses not involving shielding for specific jobs, such as shielding pipes in walkways or general access areas, had not been done promptly. For example, shielding evaluation request #70 was submitted on May 26, 1989, and had not been completed by the engineering staff by November 1989 when it was cancelled; shielding evaluation request #71 was submitted on August 22, 1989, and was not completed until February 1990; and shielding evaluation request #72 was also submitted on August 22, 1989, but had not been completed by the end of the inspection.

d. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- Use of the Five-Year Plan for planning long-term, large-capital ALARA initiatives.

- Assignment of some RWP/ALARA personnel to various project work groups to expedite RWP preparation and ALARA reviews.

Improvement Items:

- Improve short-term planning for non-outage work (including planners walking down jobsites prior to writing job plans, ensuring RWP/ALARA group is aware of jobs before the 72-hour schedule is distributed, and stopping the routine circumvention of the RSD ALARA review provision of AMMS).

- Improve the timeliness of engineering analyses for non-job specific shielding requests.

- Assign ALARA personnel to maintenance department and improve communications between the RWP/ALARA group and the Operations Scheduling Coordinator.

- Develop a formalized mechanism to assure early ALARA involvement in the development of work packages and that work planners are knowledgeable of appropriate ALARA job history file information.

- Aggressively pursue a management-directed initiative to correct the cultural attitude of some plant personnel (including members of the planning staff) that RP/ALARA activities and concerns are solely the responsibility of RSD.

- Develop a formalized mechanism to establish the responsibility for maintenance RWP initiations.

9. ALARA Initiative/Operational Practices

The inspectors reviewed records, data and discussed with licensee personnel the following dose reduction initiatives/operational practices.

a. Industry-Identified Dose Reduction Techniques

With the exception of source term reduction programs, licensee personnel indicated that Regulatory Guides and NUREG documents were not routinely reviewed to identify dose reduction techniques. However, Generic Letters and Licensee Event Reports that involved radiation protection and ALARA issues were routed to the assigned ALARA group for review for applicability and impact. The Nuclear Network system has been queried by the licensee to obtain information regarding hot spot reduction programs and entries into the containment during power operations.

The licensee is currently involved in the Combustion Engineering Owner's Group. The licensee indicated that it was participating in three EPRI/CE Owner's Group source reduction studies: Generic Guide for Cobalt Reduction, Chemical Decontamination of Primary Coolant System and Zinc Injection. The licensee indicated that funds have been appropriated to support these studies.

b. Implementation of ALARA Techniques

(1) Source Term Reduction

The licensee is making progress in reducing the incore and excore inventory of high cobalt-bearing materials as evidenced by the licensee plans to replace 30-40 high-cobalt valves during the SGRP outage and to replace in the next 3-5 years the current fuel assemblies (containing high-cobalt Inconel support grids) with assemblies which have low-cobalt Zircaloy support grids. However, this effort is characterized more by individual initiatives than by a comprehensive plant initiative. For example, valve replacements in primary systems are not routinely reviewed for cobalt reduction, although the the Pump and Valve Program Section does provide consultation to system engineers regarding cobalt reduction and valve specifications upon request. Currently, no formal program or direction exists to assure that cobalt reduction efforts will continue. There has been no general evaluation of plant systems and components for cobalt content. Nor have action plans been adopted with defined priorities to reduce the inventory of high-cobalt components within plant systems.

The licensee initiated hydrogen peroxide additions to the primary coolant system (PCS) during the 1989 and 1990 maintenance outages. This induced a controlled crud burst that was subsequently cleaned by the purification system. This cleanup resulted in removal from the PCS of significant quantities of cobalt-58, cobalt-60, dose equivalent iodine-131 and elemental nickel, and in reduction of some primary system components radiation levels. The licensee plans to continue these hydrogen peroxide additions prior to future refueling and maintenance outages.

The licensee indicated that the Electric Power Research Institute (EPRI) method of coordinated lithium-boron pH control has been adopted. This is expected to reduce crud bursts during plant operations and thereby minimize the activation of corrosion products in the PCS.

The licensee has performed several evaluations of the character of suspended activation products in the PCS. These studies indicated that most of the suspended activation products were in the 0.22 to 0.45 micron range. The licensee has begun a program to gradually down-size filters. Since one micron nominal and

six micron absolute filters were effectively about the same size, the one micron nominal filters were initially replaced with six micron absolute filters. Reportedly, the licensee plans to replace the six micron absolute filters with one micron absolute filters. Based upon filter changeout performance, the licensee expects to further reduce filter porosity.

The licensee has adopted a program to identify, track and reduce the number of hot spots in the plant. Hot spots are given a unique number and are tracked on a database. Each month, the assigned ALARA group prepares a report that prioritizes the hot spots for removal. This report is submitted to operations, radiation protection, maintenance, and construction groups for flushing, shielding and cutout/replacement, as appropriate. This report is also submitted to the Plant Manager. This program has resulted in significant dose savings. Although little attention/support appeared to be given to hot spot reduction during the recent maintenance outages, this program offers significant opportunities to further reduce exposure and to implement improved technology.

(2) Decontamination Techniques

Hydrolazing has been used extensively to perform reactor cavity decontamination, cleaning of tanks and flushing of drain lines. Steam cleaning has been used for area decontamination and tank cleaning.

Strippable coatings have been used for area decontamination, including high dose rate areas and unpainted concrete. Material compatibility studies have been completed for use of strippable coatings in the reactor cavity. The licensee indicated that these studies have concluded that reactor cavity decontamination by strippable coatings is acceptable. However, because of the extended application time, the licensee indicated that strippable coatings would not be used during the SGRP/Refueling Outage.

The licensee utilizes an electrosonic sink and manual scrubbing for tool and equipment decontamination. The freon unit used for tool decontamination is being decommissioned to obviate dealing with mixed waste issues. Other methods of decontamination are available and are utilized by other licensees.

Upon removal of the steam generators during the SGRP outage, the licensee plans to use grit blasting followed by glass bead blasting to decontaminate the pipe ends. This is to be performed in a closed environment, utilizing a modified glove bag technique.

The licensee indicated that decontamination workers brought in for the outage were screened for experience. Reportedly, emphasis was placed on obtaining previously Palisades site-experienced workers.

(3) Video and Communication Equipment

Video and communication equipment have been used for steam generator maintenance. This includes remote observation and control of eddy current testing. Communication equipment has been used with steam generator jumpers, testing personnel, and health physics to coordinate steam generator maintenance activities such as test, video, and tube-plugging equipment setup and dismantling.

The SGRP project has budgeted funds for 12 video cameras and two monitoring stations. One station is to be placed near the work site in containment and the other will be located at the containment access facility. These monitoring stations are to be used for health physics job monitoring, project supervision and worker awareness.

Funds have been budgeted to purchase an upgraded radio system that comprises a repeater station, several antennas and radio headsets. This will facilitate communications among radiation protection personnel and timely dissemination of radiological condition information.

The cameras, monitoring stations, and communication equipment have the potential of significantly reducing radiation exposure. Licensee personnel indicated that these would be used during the SGRP.

(4) Sump Cleaning

Licensee representatives indicated that containment sumps were manually cleaned. This involved manual removal of muck and accumulated debris. The licensee indicated that the use of hydrolazing and/or high powered pumps for sump cleaning had not been considered. The manual method results in increased time in the radiation area and closer contact with radioactive materials.

(5) Refueling/Reactor Head Maintenance Activities

Licensee performance on refueling and reactor head maintenance appears to be very good. In addition, the supportive working relationship between the ALARA and Refuel Engineering staffs has shown strong positive results in dose reduction and outage time savings. From 1983 to 1988, from reactor head removal to reactor head re-installation, time spent has been reduced from 28 days to 16 days and person-rem expended has been reduced from 161.8 person-rem to 71.2 person-rem.

(6) Steam Generator Maintenance

Licensee representatives indicated that the block and tackle method of removing steam generator manways was still being used. The inspectors were informed that this was due to the small amount of clearance between the steam generator (S/G) manways and the S/G platforms. During the SGRP planned for the fall of 1990, the licensee intends to lower the S/G platforms by 18 inches to facilitate the use of hydraulic lift rigs for S/G manway removal and reinstallation. If the licensee had completed this modification earlier, significant dose savings could have been realized.

The licensee indicated that the use of S/G nozzle dams was implemented in 1986. Redundant nozzle dams and improved designs were implemented during the refueling outage of 1987. The use of this technology facilitates S/G work during refueling operations and provides some shielding from radiation sources in cold and hot leg piping. This technology has been available since 1980. Significant outage time savings and dose savings could have been realized if implementation had occurred earlier.

The licensee indicated that S/G manway shields were acquired in 1987. These shields are constructed of an inch to an inch and a half of lead and are bolted directly onto the S/G manway. Each of these shields are designed with ventilation connections and can be locked to prevent unauthorized personnel access. New S/G manway shields will be used on the replacement S/Gs.

The licensee indicated that dedicated health physics coverage for steam generator maintenance began during the 1987 maintenance outage. Maintaining radiation exposure ALARA usually requires the utilization of experienced, job dedicated personnel. The use of dedicated health physics technicians for S/G maintenance has been an accepted industry practice since the 1970's. If this practice had been implemented at Palisades sooner, significant dose savings could have been realized.

(7) Steam Generator Replacement Project (SGRP)

During June 1989, licensee personnel traveled to the Indian Point #3 nuclear plant to gather information and lessons learned from the completing Indian Point #3 SGRP. In addition, a memo dated April 27, 1990, was issued to various Palisades SGRP project managers. This memo included an attached SGRP Lessons Learned list that catalogued and assigned action items to responsible organizations and individuals. These lessons learned were identified from five previous SGRPs: D.C. Cook,

Indian Point #3, Surry, Point Beach and H. B. Robinson. If lessons learned are factored into SGRP planning and are properly implemented, significant outage time and dose savings could be achieved.

The licensee prepared a sixteen page bid specification for the radiation protection and ALARA portions of the SGRP. This specification required the contractor to include time for decontamination and ALARA activities in proposed schedules and bids. In addition, the licensee and the SGRP contractor have agreed to an incentive program. This program provides bonuses for achieving dose reduction targets and financial penalties for failure to meet dose reduction targets.

The new S/Gs that will be installed during the upcoming SGRP include a number of design changes that should improve both operational performance and reduce radiation exposure. In addition, the licensee plans to pretreat the surface of the S/G channel heads. The pretreatment process will consist of mechanically cleaning and smoothing the surface. Brushing will be utilized to remove scale and debris. This will be followed by flapping and buffing to enhance surface smoothness. Finally, the S/G channel heads will be electropolished. The channel heads will then be rinsed with demineralized water to remove all residues. The licensee expects surface smoothness to be featureless at a 100X scanning electron microscope. This process is expected to minimize the corrosion layer in the S/G channel heads; and, therefore, reduce the deposition of activated corrosion products. This is expected to produce significant dose savings over the life of the plant.

In addition to installing improved S/Gs, the licensee will be performing a major overhaul of secondary system components. These modifications include: removal and replacement of condenser internals with stainless steel components; feedwater heater and drain cooler replacement; condenser boot replacement; and increases in the blowdown and recirculation system pipe sizes and in capacity of the blowdown heat exchanger.

The construction of a centralized containment access facility is underway. This facility is designed to facilitate the access of approximately two thousand entries per day. This facility will include offices for radiation protection personnel, change areas, contamination monitoring, respirator and dosimetry issue, and protective clothing and decontamination material storage.

(8) Surrogate Tour System

The licensee has acquired a computer based video laser disk (surrogate tour) system. This system contains thousands of

pictures of the inside of the containment building. These pictures cover walkways, general access areas and many close-up pictures of components such as valves, gauges, and pumps.

In addition, the licensee intends to expand this system to cover the auxiliary building. Included in this system is a database feature that allows recording of dose rate information at predetermined locations. This dose rate information is then displayed, at the request of the user, during the surrogate tour. Currently, this information (dose rate) must be manually entered at the predefined locations. An electronic means of reading dose rates which is then automatically downloaded to the database could help minimize radiation exposure during initial data gathering and updating. Additionally, further dose reductions could be achieved if surrogate tour system training were provided to those responsible for planning and performing work in the RCA.

(9) Leak Reduction Program

Approximately one year ago, the licensee commenced routine walkdowns of primary plant systems to identify leaking components. Reportedly, all components are observed within a 45-day period, then the process starts over. During the walkdowns, boric acid residue is cleaned from leaking components. The valve packings are then tightened to reduce or stop the leakage. When serious or chronic leakers are found, work orders for maintenance are written. This program has the potential to reduce the spread of contamination and to reduce radiation exposure.

(10) Robotics and Automated Equipment

The licensee has used automated eddy current testing equipment for many years. However, this rig is an older SM-4 unit that requires significant refurbishment each outage and time to work out problems. The licensee is currently investigating a newer, no-entry type fixture for eddy current testing. Reportedly, most of these newer models would require some modification. Significant dose savings could be realized by utilizing up-to-date technology. Additionally, the licensee is investigating the acquisition of a scavenger robot to perform cleaning of tank bottoms.

(11) Contractor Performance Fee Program

The licensee has established a performance appraisal system for non-SGRP construction contractors. This system identifies critical success factors that directly support the overall objectives of the licensee's program. This system provides financial incentives for the contractor to achieve expected levels of performance. These performance goals are established in two categories. Category A consists of critical success

factors measured in the areas of Quality/Procedure Compliance, Schedule and Budget. Category B consists of Safety, Radiation Protection, Housekeeping and Security. This appears to be a flexible and responsive methodology to promote worker awareness and reduce exposure. This program appears successful in that during the last two maintenance outages contractor radiation protection performance has improved significantly.

(12) Plant Operations

The Plant Operations Department has commenced a dose reduction program. Reportedly, this includes detailed evaluations of Operations Department activities. Auxiliary Operator rounds are being reviewed to determine the need for certain equipment readings and their periodicity. The licensee plans to divide the overall operations RWP into four separate RWPs. The licensee expects to identify activities that cause/contribute the most exposure. In addition, the Plant Operations Department is holding its personnel accountable for their exposure. Reportedly, this includes explanations to management for exposures in excess of 10 mrem/day. If the results of operations activities evaluations are factored into practices/procedures and are properly implemented, significant dose savings for operations personnel could be achieved.

(13) Design Initiatives

The licensee has identified numerous modifications and program enhancements. Many of these improvements have been discussed in preceding sections of this report. There have been notable successes; however, a number of projects are being deferred or cancelled. Cancellations and deferrals of modifications and the acquisition of improved, cost-effective technology is not indicative of strong management support for the ALARA Program. A summary of these project deferrals and cancellations are listed below:

- Shielding Software Package - Proposed in 1987 to expedite seismic evaluations was dropped in 1988.

- Containment Permanent Shielding - Was scheduled for 1990 but has been deferred until 1992.

- Reactor Head Shielding Upgrade - Scheduled for installation in 1990, but deferred until 1992, reportedly due to engineering problems.

- Radwaste Evaporator Evaluation - Scheduled for 1991 but deferred until 1992.

- Computerized RWPs - Reportedly, this project has been indefinitely deferred.

c. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strengths:

- The strong ALARA/refueling engineering interface has resulted in significant dose savings.
- Improved design of new steam generators are expected to produce significant dose savings over the life of the plant.
- The contractor fee performance program has resulted in improved ALARA performance.

Improvement Items:

- Increase management support for ALARA design, modification and technology improvements.
- Develop a formalized, systematic cobalt reduction program.
- Provide training on the surrogate tour system to personnel who plan or perform work in RCA.
- Improve data collection methods for surrogate tour system.
- Update steam generator in service inspection technology.
- Update tool and equipment decontamination technology.

10. Assessment/Self-Evaluations

a. Effectiveness of Internal and External Audits

All audit reports supplied to the inspectors by the licensee were performed by licensee auditors with no reports by independent contractors. However, two contractor personnel are assisting with the comprehensive assessment of the RP program. The routine audit schedule includes an annual audit of all RP program elements by corporate QA personnel and quarterly surveillances by site QA personnel. The auditors are former RP department personnel and therefore able to conduct technically sound audits. In 1989, the audit approach was shifted from compliance towards performance based observations. This resulted in an improved audit report in 1989 that made four significant recommendations for improvement in the

ALARA program. However, no reply is required to recommendations in an audit report. The quarterly surveillances have consistently identified problems with work practices but have not focused on ALARA activities. Although the audits and surveillances are improving, the ALARA area has not been selected for increased attention at this time. QA management stated that increased attention could be provided to ALARA, if needed. The inspectors concluded that the primary assessments of the ALARA program are conducted by site personnel.

In a separate effort the licensee initiated a major project called the "HP Self-Assessment" in February 1990. This project uses innovative auditing techniques developed onsite by the Industry Experience and Assessment (IE&A) Department. Some unique characteristics include:

(1) A very detailed assessment plan is developed based on INPO documents, industry experiences, and NRC inspection findings. The plan results in a very large but highly structured data base of findings and observations.

(2) A permanent team consisting of two site RP personnel and two technical expert contractors, are provided on-the-job training by IE&A personnel throughout the project. Training includes interview techniques, data analysis methodologies, and analytical techniques. Other temporary team members are included for specialized areas and are similarly trained.

(3) The formulation of corrective action for identified deficiencies is done in "Alignment Meetings." These meetings between the team leaders, responsible managers and IE&A facilitators determine root causes and "align" the corrective action.

The HP Self-Assessment includes all areas of the HP programs onsite and will not be completed until July or August 1990. The licensee stated that appropriate corrective actions would be expedited to the maximum extent possible prior to the Steam Generator Replacement Outage later this year. However, because only some of the licensee-identified weaknesses could be resolved before the SGRP outage, the licensee stated that emphasis would be placed on priority items. Thus, the 1990 RP/ALARA self assessment corrective actions may have limited SGRP effectiveness.

b. Post-Job ALARA Reviews

The inspectors reviewed selected completed job packages which included post-job ALARA reviews. Most ALARA reviews indicated good sensitivity to ALARA concerns and provided good recommendations for improvement. However, the mechanisms to ensure implementation of the recommendations was not well defined.

c. Post-Outage ALARA Reports

The inspectors reviewed the 1988 Refueling Outage Report. Section II.A includes an analysis of ALARA activities in support of the outage. There were eight recommendations put forward, although most were administrative in nature. There was no separate review of ALARA performance.

A corrective action plan was drafted to followup on findings in the outage report. The plan was not implemented and the status of corrective action was indeterminate. Licensee personnel were uncertain as to when the plan would be reinstated. The inspectors concluded that the use of this post-outage review was ineffective. After the inspector concerns were brought to the licensee's attention, the SGRP RP/ALARA personnel extracted those recommendations which were desirable to incorporate into the SGRP ALARA program. Because of the relatively short time before SGRP outage activities begin, the 1988 refueling outage corrective actions may have limited SGRP effectiveness.

d. Identification of Chronic Plant Problems

The ALARA Coordinator analyzed the personnel exposures that occurred between 1983 and 1988 and identified four chronic problem areas as follows:

(1) Steam Generator inspections and repairs
(2) Reactor Refueling operations
(3) Health Physics technician exposure
(4) Valve repairs in the safety injection systems

The ALARA staff focused its efforts in these areas with mixed results. A high degree of success was achieved in reducing reactor refueling exposures, such that, it will be removed from consideration as a chronic problem. However, the three other areas remain problematic. Efforts to implement effective corrective actions are continuing by treating these areas as separate projects to enlist the support of the planning and work groups to identify exposure saving techniques. Station management has targeted completion of these efforts by 1991.

e. Summary and Conclusions

The licensee has not undertaken a complete audit or assessment of the ALARA program alone to identify the causes for the consistent poor performance. Auditing efforts thus far are conducted very well by highly qualified licensee personnel but have been directed at the broad area of RP programs.

f. Assessment Findings

Based on the above review, the following assessment findings were identified regarding the licensee's ALARA program.

Strength: Began a comprehensive self assessment of the RP/ALARA Program.

Improvement Items:

- Be more timely in implementing corrective actions in response to ALARA weaknesses identified during the 1988 refueling outage and the 1990 self assessment.

- Focus auditing efforts on the ALARA program, using outside sources of information in support of assessments.

11. Exit Meeting

The scope and findings of the inspection were summarized on May 31, 1990, with those persons indicated in Section 1. The inspectors described the areas inspected, indicating that although the licensee had a generally adequate ALARA program, there was still room for considerable improvement in almost all areas of the program. The licensee acknowledged the inspection findings without exception. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

ATTACHMENT 1

Collective Dose Analysis
for
Palisades Nuclear Generating Station

A. Collective Dose Per Reactor (Person-Rem/Year)

	1986	1987	1988	1989
Palisades	636	417	730	294
Average PWR (NUREG-0713)	390	371	336	*
% Difference	+63%	+12%	+117%	*
Rank (Highest)	8th out of 59	13th out of 64	4th out of 68	*

*Data Unavailable

B. Annual Individual Dose (mrem/year)

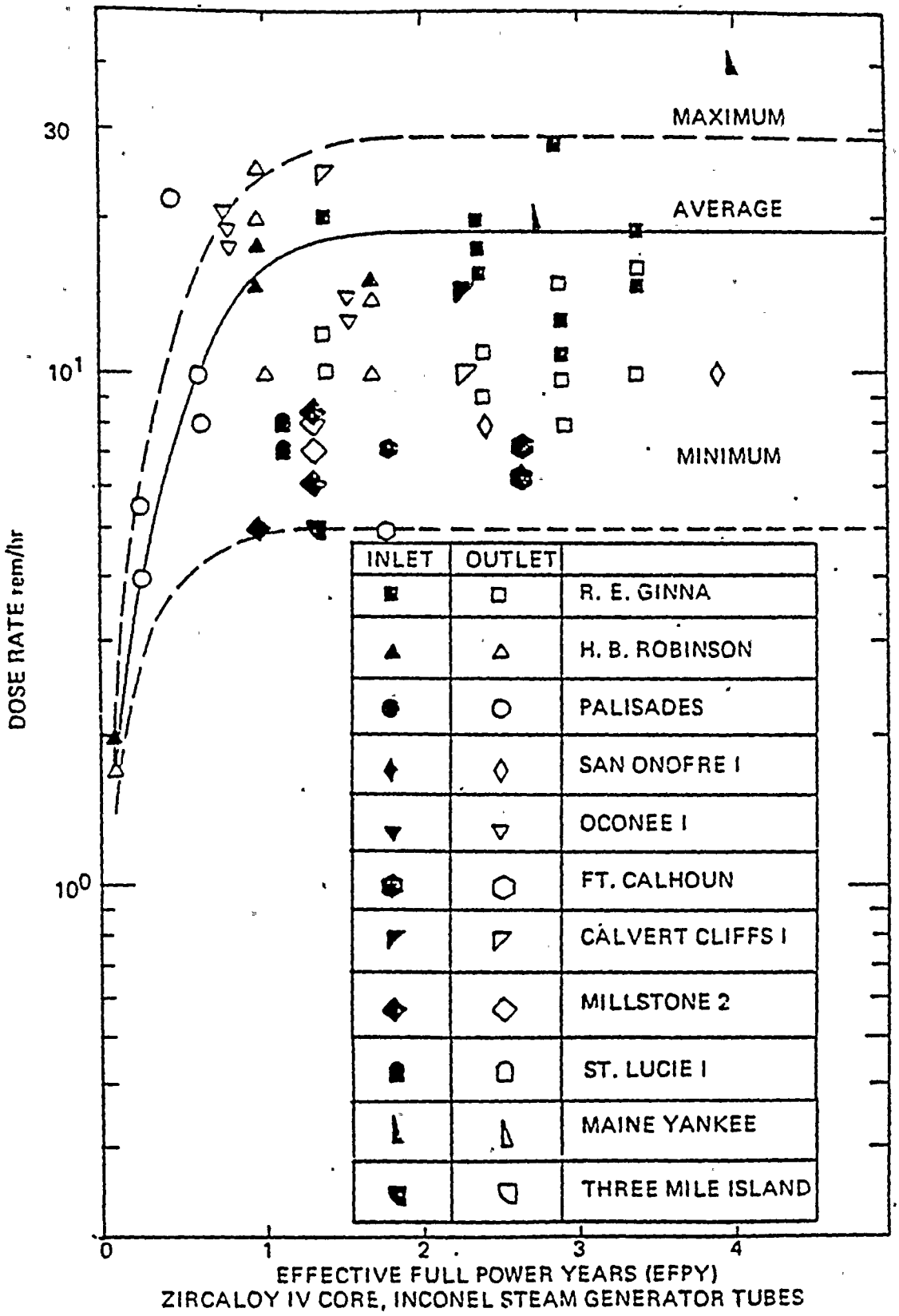
	1986	1987	1988	1989
Palisades	442	372	500	286
Average PWR (NUREG-0713)	370	379	360	*
% Difference	+20%	- 2%	+39%	*

*Data Unavailable

C. Daily Collective Dose per Reactor (mrem/day)

	Non-Outage Dose Rate	Outage Dose Rate
Palisades (1986-1989)	330	2520
Average PWR >15 years old (Hinson 90)	149	4140
% Difference	+121%	-39%

Attachment 2



STEAM GENERATOR TUBESHEET SHUTDOWN RADIATION LEVELS AT VARIOUS PWR's

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ATTACHMENT 3

A. REPETITIVE HIGH DOSE JOBS DURING OUTAGES

Collective Dose Summaries
for
Palisades versus Combustion Engineering PWRs
(NUREG/CR-4254, May 1985)

Job Title	Collective Dose (person-rem)			Population Size	Palisades (person-rem)		
	Min	Max	Avg		1983 RFO	1985 RFO	1988 RFO
Steam Generator Tube Plugging	4.5	580	120	9	27.8	5.2	29.0
Reactor Disassembly/Assembly	20	160	68	13	95.2*	59.2	38.3
Snubber, Hanger, & Anchor Bolt Inspection and Repair	0.90	220	34	12	1.1	2.4	2.4
Steam Generator Eddy Current Testing	3.1	140	31	16	135.0*	62.9*	46.9*
In-Service Inspection	0.58	49	24	14	91.0*	40.8*	30.4*
Reactor Coolant Pump Seal Replacement	5.6	64	18	15	__ **	3.7	4.8
Steam Generator Manway Removal/Replacement	1.5	26	9.9	15	18.0*	7.0	6.1
Fuel Shuffle/Sipping & Inspection	2.2	15	7.0	12	10.1*	2.0	4.6
Cavity Decontamination	1.8	11	5.3	12	__ **	3.2	6.9*
Totals	40	1300	320		390	190	170

*Indicates collective doses greater than average value for CE pressurized water reactors.

**Data Unavailable.

ATTACHMENT 3

B. REPETITIVE HIGH DOSE JOBS DURING ROUTINE OPERATIONS AND OUTAGES

Collective Dose Summaries
for
Palisades versus Combustion Engineering PWRs
(NUREG/CR-4254, May 1985)

Job Title	Collective Dose (person-rem)			Population Size	Palisades (person-rem) Routine OPs & Outages				
	Min	Max	Avg		1985	1986	1987	1988	1989
Plant Decontamination	0.70	160	20	12	26.1*	4.9	24.4*	33.0*	12.7
Routine Op-Surv & Valve Lineups	7.0	22	13	6	13.5*	2.3	19.3*	11.6	16.5*
Instr Repair & Calibration	1.3	38	9.7	13	49.9*	12.7*	17.0*	13.5*	8.8
Pri Valve Maint & Repair	0.10	34	12	8	11.1	18.5*	29.6*	8.4	20.1*
CVCS Repair & Maintenance	0.6	8.3	4.8	3	38.5*	85.8*	29.4*	11.1*	12.3*
Shutdown Cooling System Repairs & Maintenance	0.96	0.96	0.96	1	59.6*	77.4*	49.7*	70.7*	7.2*
Totals	11	260	60		200	200	170	150	78

*Indicates collective dose greater than average value for CE pressurized water reactors.

ATTACHMENT 4

Total Adjusted Collective Doses (Excluding Special Maintenance (SM))

A. Palisades Doses (Person-Rem/Year)

Year	Total	SM	SM%	Adjusted Total
1986	636	5	0.8	631
1987	417	72	17.3	345
1988	730	75	10.3	655
1989	294	77	26.2	217

B. Average U.S. PWR Doses (Person-Rem/Year)

Year	Total	SM#	SM%	Adjusted Total
1986	390	120	30.4	270
1987	371	125	33.6	246
1988	336	110 @	32.0 @	226
1989	*	*	*	*

* Data Unavailable
\# NUREG-0713
@ Since data is not available, 1988 SM percent of average U.S. PWR dose was assumed to be the average of the 1986 and 1987 SM percents.